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## VENTED CONTAINER CLOSURE LIDS

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This invention relates to container closure lids and more particularly to container lids having vent means permitting the passage therethrough of vapors, such as gases, steam or air, while preventing the passage of liquids.

In the packaging of potable liquids and certain foods in closed containers, it is desirable, and sometimes essential, to provide a venting means which will relieve the differential of pressure between the interior and the exterior of the closed container. The differential in pressure may be due to one or more causes. More generally the cause is the thermal difference between the contents of the container and the exterior, such as is experienced with hot drinks or chilled or frozen foods; but at other times the cause may be the liberation of gases from a liquid, e.g., a carbonated beverage, or gases or entrapped air from a food. In the absence of a vent the closure lid may be displaced, or if locked in sealed relationship, as by crimping, the lid or container may be bulged or distorted or even may burst. Heretofore the problem has been to provide a suitable vent means for the escape of vapors, while at the same time preventing the escape of liquids.

By way of example, in putting up hot drinks, such as coffee, chocolate, soup, etc., for "carry-out" service, it is customary to place the same in a container such as a cup known for such purposes and confine the same therein by means of a closure lid which fits the lip of the container in liquid sealing engagement. However, the hot liquid expands the entrapped air or other vapors, such as steam, and the resulting pressure breaks the liquid seal between container and closure lid and permits the liquid to escape.

The expedient usually employed is to provide a vent by puncturing the lid with one or more small holes, but it has been found that this permits the coffee or other liquid to escape; thus making an unsightly stain and permitting the liquid to collect on the top of the lid. Also, if the closed container is tipped, a substantial amount of liquid may escape. Efforts have been made to avoid this by using a lid with a double top comprising spaced end walls with small holes in the outer wall offset from small holes in the inner wall; and in another form by using a plurality of pressure equalizing chambers. However, these expedients, while reducing the leakage, have not proven satisfactory, either from a manufacturing or a use standpoint.

The invention will also be found useful in permitting the escape of gas from carbonated beverages, while preventing the escape of liquid. Likewise, in packaging foods it is sometimes desirable to permit the passage of air inwardly into, or the passage of air or other vapors outwardly from the closed container, while preventing the escape of liquid components of the packaged food.

The present invention provides a closure lid adapted for sealing engagement with a container and permits vapors under pressure to escape through the cover, while preventing the escape of liquid. The pressure contemplated is the differential between atmospheric pressure and the pressure within the closed container, so that whether the internal pressure be greater or less than atmospheric pressure, air or other vapors may pass through the lid but liquids may not.

An object of our invention is to provide a closure lid

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of the particular type suitable for the type of container desired to be closed and which lid is pervious to vapors and impervious to liquids.

Another object is to provide a closure lid which may be economically made, readily used and which will permit the passage therethrough of vapors while preventing the passage of liquids.

Other and further advantages and features of the invention will be more fully understood from the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a top plan view showing an embodiment of the invention in which the lid is shown in use on a container of the type having a rolled rim and a spaced annular groove;

FIG. 2 is a cross-sectional view taken on the line 2-2 of FIG. 1;

FIG. 3 is a bottom plan view of the lid shown in FIGS. 1 and 2;

FIG. 4 is a cross-sectional view similar to FIG. 2 but showing a somewhat modified form of lid in use on a container such as on a paper cup of conventional type;

FIG. 5 is a plan view showing a further embodiment of the invention;

FIG. 6 is a cross-sectional view taken at line 6-6 of FIG. 5 and showing the lid applied to a container such as shown in FIG. 2;

FIG. 7 is a cross-sectional view showing a further embodiment of the invention comprising a cylindrical type of lid in frictional sealing engagement with a cylindrical container partly broken away; and

FIG. 8 is a cross-sectional view showing a further embodiment of the invention comprising a disc type lid in sealing engagement within an internal peripheral groove formed in the lip of a container, partly broken away.

Referring to the drawings, and more particularly to FIGS. 1, 2 and 3:

The lid made in accordance with my invention is designated in general as 10, and is applied to a container designated in general as 11. The lid in the present embodiment is vacuum formed from plastic material such as polystyrene and has a wall thickness of about .010"; but the thickness may, of course, vary within limits well understood in the art, and the lid may be made of other suitable plastic material, e.g. polypropylene. In the present embodiment the container 11 is of conventional type such, for example, as that made by Lily-Tulip Cup Corporation and sold under its trademark "Nestrite®," having a mouth provided with an internal peripheral groove 12 and a beaded rim 13. The lid 10 comprises an end wall 14 and a peripheral rim portion for sealing engagement with the mouth of the container. The peripheral rim portion is preferably provided with a bead 15 for engagement in the groove 12 and with a skirt 16, generally U-shaped in cross section, for locking engagement with the rolled rim 13 of the container in the customary manner.

The end wall 14 is provided with an outwardly offset portion 17 forming an interior recess 18, and said offset portion 17 is provided with a relatively small vent hole 19. The end wall 14 is provided with a vent area pervious to vapors and impervious to liquids. In the present embodiment, such vent area is provided with a barrier formed by a piece of sheet material or layer 20 extending across and covering the recess 18 and secured in liquid-tight engagement with the end wall surrounding said recess. Preferably, the margin of this sheet is secured to the plastic end wall by heat and pressure, and preferably the heat and pressure are applied to a narrow marginal zone designated 20a (FIGS. 1 and 3) to facilitate the sealing. In the present embodiment, the sheet material 20 consists

of a piece of filter paper impregnated with a water repellent capable of withstanding a temperature of at least 180° F. and preferably up to about 200° F. The filter paper which we have found entirely satisfactory is filter paper having a basis weight of 25 lbs. with a thickness of about .0045" in which the pores are of random size with maximum size of 0.0005". However, it is contemplated that the filter paper may have a thickness of .002" to about .008". In practicing our invention we have successfully used as a water repellent a chrome complex such as that sold by E. I. du Pont de Nemours & Co., under its trademark Quilon®. In general, for an 8 oz. container, it is preferable to have a vent area of about 1 square inch and accordingly the recess 18 has an area in the plane of the sheet material 20 of about 1 square inch to permit ready escape of vapors therethrough. Larger containers would, of course, require a proportionately larger vent area. The hole 19 may be as small as about 1/16" but may be substantially larger, if desired; but normally, it is preferable to keep this hole relatively small.

It will be readily appreciated from the foregoing that the porous cellulosic material 20 is protected against being accidentally punctured by the offset end wall portion 17 and that the recess 18 further provides in effect an equalizing chamber to permit expansion and slow the passage of vapors. While it is preferred to use filter paper or other porous cellulosic sheet material from a practical and economical standpoint; it is contemplated that other sheet material may be employed having similar properties. Another material contemplated is a sheet of micro-porous plastic with a thickness of about .012" in which the pores have a diameter of about 8 to 12 microns. It has been found that with the use of such a micro-porous plastic sheet material the vent area required is appreciably larger than that required for the filter sheet described in connection with FIGS. 1-3, and for a satisfactory result, should be approximately 3 square inches for an 8 oz. container. For this reason and because of the relative cost, the treated filter paper is preferable.

In FIG. 4 a modification is shown in which the lid is designated as 10' and the peripheral rim portion is of generally U-shape in cross section and is designated 16'. In this embodiment, the lid is shown secured to a cup designated 11' having a beaded rim 13' but no internal recess such as the recess 12 of FIG. 2. Therefore, in the embodiment of FIG. 4 the lid depends for its sealing engagement upon a snug fit within the body of the cup 11' and upon tight fitting engagement of the rim 13' by the U-shaped skirt 16'. Accordingly, in this embodiment the lid does not have a bead such as 15 of FIG. 2, and the end wall 14' of the lid is disposed closely adjacent the U-shaped peripheral edge 16' with the offset portion 17' about level with the top thereof. Other parts of the lid 10' are identical with the structure previously described in connection with FIG. 2 and are identified with corresponding numerals to which the prime (') suffix has been affixed, and therefore will need no further description.

In FIGS. 5 and 6 we have shown a modified form of the invention in which the lid is designated in general as 30 and the container is designated in general as 31 and is of the same type as that above described in connection with FIG. 2. The lid comprises an end wall 32 and a peripheral rim portion 33 serving to hold the lid in sealing engagement with the mouth 34 of the container 31 in a manner similar to that heretofore described with respect to FIG. 2. In this embodiment, the lid 30 may be conveniently made of either plastic or paper material and the end wall is provided with an opening 35, over which a piece of sheet material 36 of the character above described extends so as to cover the hole 35 and its marginal edges are secured to the end wall 32 by adhesive or sealing to the interior of the end wall 32 throughout the zone 37 surrounding said hole. In some respects this embodiment is not as desirable as in previous embodiments because

the vent area is not protected by an offset portion of the end wall and is subject to possible damage if roughly handled. However, it will be obvious that the lid will function satisfactorily in normal use and has manufacturing advantages for certain uses.

In FIG. 7 an embodiment is shown in which the lid is designated as 40 and is made of paper board or the like material, comprising an end wall 41 and a peripheral rim portion 42 which is of generally cylindrical form; the end wall and its peripheral rim being secured together by a joint 43 in accordance with conventional practice. The end wall 41 is provided with a hole or vent opening 44 which is covered by a piece of sheet material 45 of the character above described, to thereby provide a vent area for the lid which is pervious to vapors and impervious to liquids. The lid is shown in sealing engagement with a cylindrical container designated in general as 46, the lip of which is frictionally tightly engaged by the peripheral rim portion 42.

In FIG. 8 a further embodiment is shown in which a container, designated generally as 50, is closed by a disc type lid 51, whose peripheral edge 52 is tightly engaged in the internal recess 53. The disc lid 51 is provided with a vent hole 54 which is covered by a piece of sheet material 55 which is secured in liquid-tight engagement with the interior of the disc lid 51 surrounding said opening. The sheet material 55 being of the nature and character above described, thereby serves to provide a vent area pervious to vapors and impervious to liquids.

Having thus described our invention with particularity with reference to preferred embodiments of the same, and having referred to some of the possible modifications thereof, it will be obvious to those skilled in the art after understanding our invention, that other changes and modifications may be made therein without departing from the spirit and scope of the invention, and we aim in the appended claims to cover such changes and modifications as are within the scope of the invention.

What we claim is:

1. A flexible container lid for use on a container of the type having a mouth defined by a beaded lip and an internal peripheral groove below said lip; said lid comprising an end wall and a peripheral rim portion constituted by relatively thin plastic material, said end wall being provided with an outwardly offset portion defining an interior recess of substantial size and a surrounding boundary of said end wall, said peripheral rim portion being provided with a bead adapted for inter-fitting engagement in the groove of said container and with a skirt generally U-shaped in cross section adapted for locking engagement with the beaded lip of said container, a separate sheet of filter paper impregnated with a water repellent and extending over said recess with its peripheral margin adhesively secured in liquid-tight engagement to said surrounding boundary and providing conjointly with said offset portion a chamber, said impregnated filter paper being pervious to vapors at relatively low temperatures generated by liquids up to about 200° F. and impervious to potable liquids having a temperature of at least 180° F., said offset portion having a relatively small hole placing said chamber in communication with atmosphere.

2. A flexible container lid for use on a container of the type having a mouth defined by a beaded lip; said lid comprising an end wall and a peripheral rim portion constituted by relatively thin plastic material, said end wall being provided with an outwardly offset portion defining an interior recess of substantial size and a surrounding boundary of said end wall, said peripheral rim portion being provided with an upwardly extending skirt generally U-shaped in cross section adapted for frictional sealing engagement with the beaded lip of said container, a separate sheet of filter paper impregnated with a water repellent and extending over said recess with its peripheral margin adhesively secured in liquid-tight engagement

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to said surrounding boundary and providing conjointly with said offset portion a chamber, said impregnated filter paper being pervious to vapors at relatively low temperatures generated by liquids up to about 200° F. and impervious to potable liquids having a temperature of at least 180° F., said offset portion having a relatively small hole placing said chamber in communication with atmosphere.

3. A flexible container lid as set forth in claim 2 in which said sheet of filter paper has a thickness of the order of .002"-.008", said sheet of filter paper having an exposed porous area of the order of at least 1 square inch in which pores not exceeding .0005" in diameter are disposed throughout.

4. A flexible container lid for use on a container of the type having a mouth defined by a beaded lip for liquid-tight engagement with said lid; said lid comprising a peripheral rim portion including a skirt generally U-shaped in cross section adapted for liquid-tight engagement with said beaded lip and an end wall having a boundary defining vent opening of substantial size extending through said end wall in a direction from the

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interior face to the exterior face thereof, and a separate sheet of filter paper covering said vent opening and secured in fluid-tight engagement to a relatively flat surface on the interior face of said end wall forming the boundary of said vent opening, said filter paper being impregnated with a water repellent capable of withstanding a temperature of at least 180° F. and having a thickness of the order of .002"-.008", said sheet of filter paper having an exposed porous area of the order of at least 1 square inch in which pores not exceeding .0005" in diameter are disposed throughout.

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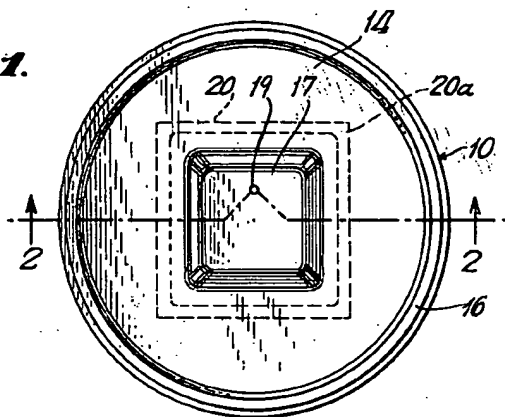
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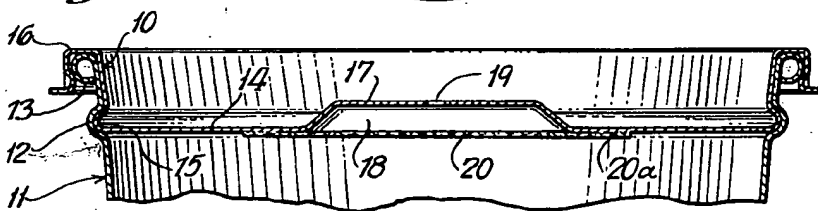
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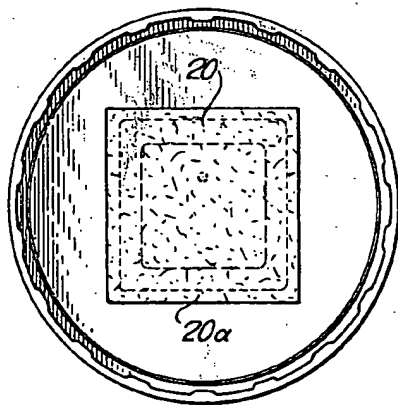
*Fig. 1.*



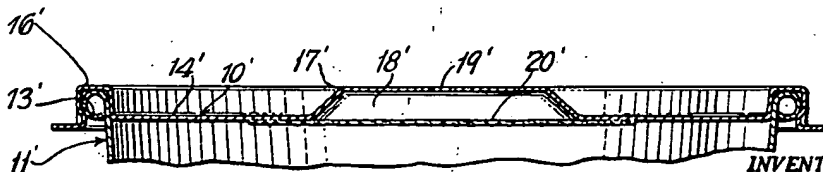
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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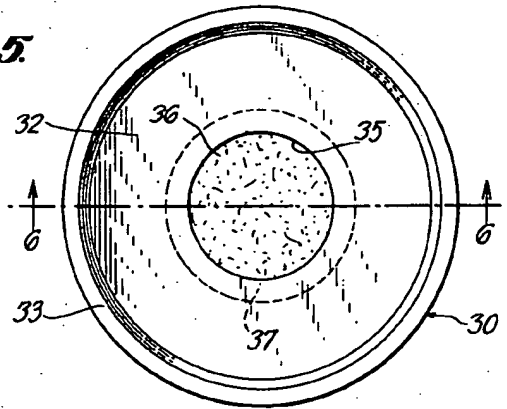
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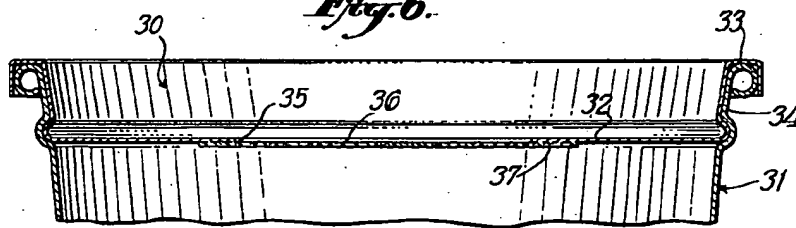
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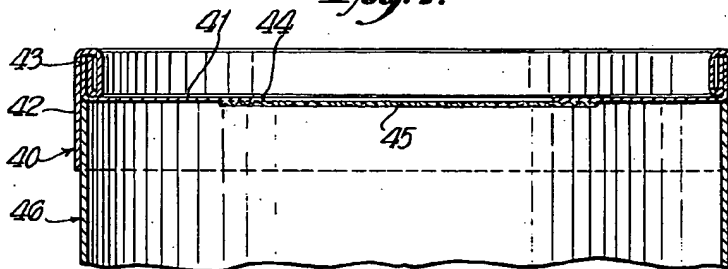
*Fig. 5.*



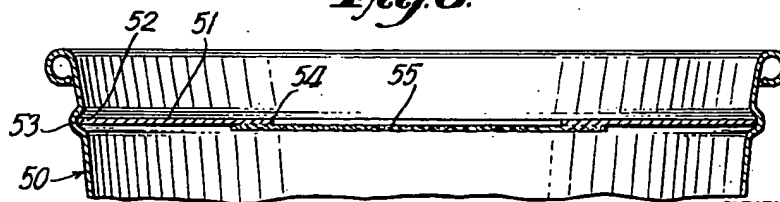
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



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